CLAIMS

What is claimed is:

1. A golf ball comprising at least a layer which comprises a material formed from the isomerization of a solution of polybutadiene and a sensitizer by a radiation source to form a solution-converted polybutadiene that comprises an amount of *trans*-polybutadiene greater than an initial amount of *trans*-polybutadiene present before isomerization and wherein the isomerization occurs after polymerization.

2. The golf ball of claim 1, wherein said layer further comprises a non solution-converted polybutadiene.

3. The golf ball of claim 1, wherein the pre-isomerization polybutadiene comprises from about 50% up to about 90% *cis*-polybutadiene.

4. The golf ball of claim 3, wherein the pre-isomerization polybutadiene comprises at least about 95% *cis*-polybutadiene.

5. The golf ball of claim 1, wherein the solution-converted *trans*-polybutadiene is from about 20% up to about 60%.

6. The golf ball of claim 1, wherein the solution-converted *trans*-polybutadiene is at least about 95%.

7. The golf ball of claim 1, wherein the pre-isomerization polybutadiene is primarily *cis*-polybutadiene and the solution-converted polybutadiene comprises increased *trans*-polybutadiene content.

8. The golf ball of claim 1, wherein the sensitizer comprises an organic bromine compound, an organic sulfur compound, or a mercaptan.

9. The golf ball of claim 1, wherein the sensitizer comprises allyl bromide, carbon tetrabromide, bromobenzene, phenyl sulfide, allyl sulfide, phenyl disulfide, isobutyl disulfide, allyl mercaptan, thio-2-naphthol or elemental bromine.

10. The golf ball of claim 1, wherein the solution-converted polybutadiene is substantially free of crosslinking, cyclization and gel formation.

11. The golf ball of claim 1, wherein the solution-converted polybutadiene comprises less than about 7% vinyl isomer.

12. The golf ball of claim 11, wherein the solution-converted polybutadiene comprises less than about 2% vinyl isomer.

13. The golf ball of claim 1, wherein the radiation source comprises ultraviolet radiation or gamma radiation.

14. A golf ball comprising at least a layer which comprises a material formed from the isomerization of a solution of polybutadiene and a catalyst compound that generates bromine or thiol radicals on thermolysis to form a solution-converted polybutadiene that comprises an amount of *trans*-polybutadiene greater than an initial amount of *trans*-polybutadiene present before isomerization and wherein the isomerization occurs after polymerization.

15. The golf ball of claim 14, wherein said layer further comprises a non solution-converted polybutadiene.

16. The golf ball of claim 15, wherein the pre-isomerization amount of polybutadiene comprises from about 50% up to about 90% *cis*-polybutadiene.

17. The golf ball of claim 16, wherein the pre-isomerization amount of polybutadiene comprises at least about 95% *cis*-polybutadiene.

18. The golf ball of claim 14, wherein the solution-converted *trans*-polybutadiene is from about 20% up to about 60%.

19. The golf ball of claim 14, wherein the solution-converted *trans*-polybutadiene is at least about 95%.

20. The golf ball of claim 14, wherein the pre-isomerization polybutadiene is primarily *cis*-polybutadiene and the solution-converted polybutadiene comprises increased *trans*-polybutadiene content.

21. The golf ball of claim 14, wherein the catalyst compound comprises nitrogen dioxide.

22. The golf ball of claim 14, wherein the solution-converted polybutadiene is substantially free of crosslinking, cyclization and gel formation.

23. The golf ball of claim 14, wherein the solution-converted polybutadiene comprises less than about 7% vinyl isomer.

24. The golf ball of claim 23, wherein the solution-converted polybutadiene comprises less than about 2% vinyl isomer.

25. A method for making a golf ball comprising:

(i) creating a solution of polybutadiene;

(ii) mixing an amount of a photo-sensitizer with the polybutadiene in solution;

(iii) exposing the mixture to a source of radiation for a sufficient amount of time to increase the amount of *trans*-polybutadiene in the polybutadiene in solution;

(iv) recovering the polybutadiene; and

(v) forming the polybutadiene into one or more components of a golf ball.

26. The method of claim 25, wherein the step of creating a solution of polybutadiene comprises creating a solution in benzene.

27. The method of claim 25, wherein the step of creating the solution comprises creating between about a 0.5% solution and about a 5% solution of polybutadiene.

28. The method of claim 25, wherein the step of mixing the photo-sensitizer comprises creating between about a 10% solution and about a 15% solution of the photo-sensitizer.

29. The method of claim 28, wherein the photo-sensitizer comprises an organic bromine compound, an organic sulfur compound, or a mercaptan.

30. The method of claim 28, wherein the sensitizer comprises allyl bromide, carbon tetrabromide, bromobenzene, phenyl sulfide, allyl sulfide, phenyl disulfide, isobutyl disulfide, allyl mercaptan, thio-2-naphthol or elemental bromine.

31. The method of claim 25, wherein the resulting polybutadiene is substantially free of crosslinking, cyclization and gel formation.

32. The method of claim 25, wherein the resulting polybutadiene comprises less than about 7% vinyl isomer.

33. The method of claim 32, wherein the resulting polybutadiene comprises less than about 2% vinyl isomer.

34. The method of claim 25, wherein the radiation source comprises ultraviolet radiation or gamma radiation.

35. The method of claim 25 further comprising the step of placing the mixture under an inert atmosphere.

36. The method of claim 35, wherein the inert atmosphere comprises nitrogen or argon.

37. The method of claim 25 further comprising the step of combining one or more additives with the recovered polybutadiene.

38. The method of claim 25, wherein the step of exposing the mixture to radiation for a sufficient period of time increases the *trans*-polybutadiene content to an amount from about 20% up to about 60%.

39. A method for making a golf ball comprising:

(i) creating a solution of polybutadiene;

(ii) heating the solution to a desired temperature;

(iii) mixing an amount of a catalyst compound that generates bromine or thiol radicals on thermolysis with the polybutadiene in solution;

(iv) maintaining the mixture a the desired temperature for a sufficient period of time to increase the amount of *trans*-polybutadiene in the polybutadiene in solution;

(v) recovering the polybutadiene; and

(vi) forming the polybutadiene into one or more components of a golf ball.

40. The method of claim 39, wherein the step of creating a solution of polybutadiene comprises creating a solution in benzene.

41. The method of claim 39, wherein the step of creating the solution comprises creating between about a 0.5% solution and about a 5% solution of polybutadiene.

42. The method of claim 39, wherein the catalyst compound comprises nitrogen dioxide.

43. The method of claim 39, wherein the resulting polybutadiene is substantially free of crosslinking, cyclization and gel formation.

44. The method of claim 39, wherein the resulting polybutadiene comprises less than about 7% vinyl isomer.

45. The method of claim 44, wherein the resulting polybutadiene comprises less than about 2% vinyl isomer.

46. The method of claim 39, wherein the polybutadiene is heated to temperature of between about 90°C and about 100°C.

47. The method of claim 39, wherein the mixture is maintained at the desired temperature for a period of time of up to about 2.5 hours.

48. The method of claim 39 further comprising the step of placing the mixture under an argon atmosphere.

49. The method of claim 39 further comprising the step of combining one or more additives with the recovered polybutadiene.

50. The method of claim 39, wherein the step of maintaining the mixture at the desired temperature increases the *trans*-polybutadiene content to an amount from about 20% up to about 60%.

51. A golf ball comprising at least a layer which comprises a polymeric blend including first polybutadiene, wherein the polymeric blend is cured during a molding process, wherein the cure gradient is decoupled from the *trans* gradient of the first polybutadiene.

52. The golf ball of claim 51, wherein said layer further comprises a second polybutadiene wherein the cure gradient is substantially coupled to the *trans* gradient of the second polybutadiene.

53. The golf ball of claim 51, wherein the first polybutadiene is a polybutadiene that had its *trans* content increased by a radiation induced.

54. The golf ball of claim 51, wherein the first polybutadiene is a polybutadiene that had its *trans* content increased by thermolysis.

55. The golf ball of claim 51, wherein said layer further comprises a cross-linking agent and a filler.